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DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO.

TR/GS/AEO/2024

**TEST BOOKLET
GENERAL STUDIES**

Test Booklet Series



(Signature of the Candidate)

(Invigilator's Signature)

Time Allowed – Three (03) hours

Maximum Marks – 170

INSTRUCTIONS

1. PLEASE CHECK THE TEST BOOKLET DOES NOT HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. ENCODE CLEARLY THE TEST BOOKLET SERIES A, B, C OR D AS THE CASE MAY BE IN THE APPROPRIATE PLACE ON THE ANSWER SHEET BY BLACK BALL POINT PEN ONLY.
3. This Test Booklet contains 170 items (questions). Each question has four responses (answers). You will select the responses which you want to mark on the Answer Sheet. In case you feel that there is more than one correct response, mark the response which you consider the most appropriate. In any case, choose **ONLY ONE** response for each item.
4. You have to mark all your responses **ONLY** on the separate Answer Sheet provided. See directions in the Answer Sheet.
5. All items carry equal marks.
6. Before you proceed to mark on the Answer Sheet the responses to various items in the Test Booklet, you have to fill in some particulars on the Answer Sheet as per instructions sent to you with your Admission Certificate.
7. After you have completed filling in responses on the Answer Sheet and the Examination is completed, you should handover the Answer Sheet to the Invigilator only. You are permitted to take away the Test Booklet.
8. Sheets for rough work are appended on the Test Booklet at the end.
9. **Penalty for wrong answers :**
 - (a) There will be four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **one-fourth** of the marks assigned to that question will be deducted as penalty.
 - (b) If a candidate gives more than one answer, it will be treated as a **Wrong Answer** even if one of the given answers happens to be correct and there will be same penalty as above to that question.
 - (c) If a question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.

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Four options are given against each of the following questions. Select the best/correct option from among the four options and encode in the answer sheet by using **Black Ball Point Pen** only as per example given below :

Example : The capital of India is :

(A) Delhi

☒ (B) New Delhi

(C) Indraprastha

(D) None of these.

PART - A

Direction for Question Nos. 1 & 2

Select the appropriate preposition to fill in the blanks in the following sentences.

1. The teacher ordered me to write _____ ink.

(A) with

(B) in

(C) of

(D) on

2. The lion sprang _____ the cow.

(A) upon

(B) on

(C) over

(D) at

Direction for Question Nos. 3 & 4

Select the appropriate article to fill in the blanks in the following sentences. Select 'Zero article' if no article is required.

3. Gold is _____ precious metal.

(A) the

(B) a

(C) an

(D) Zero article

4. The Sun is _____ source of all life on the earth.

(A) a

(B) the

(C) an

(D) Zero article

Direction for Question Nos. 5 to 7

Choose the correct synonym. (most nearest meaning)

5. Absolve

(A) convict

(B) condemn

(C) pardon

(D) reject

6. Demeanor

(A) improperness

(B) adventure

(C) attitude

(D) propriety

7. Fatal

(A) lethal

(B) saving

(C) protecting

(D) animosity

Direction for Question Nos. 8 to 10

Choose the correct antonym. (most opposite meaning)

8. Lament

(A) mourn

(B) bewail

(C) jubilate

(D) transitory

9. Inhibit

(A) allow

(B) prohibit

(C) check

(D) tolerant

10. Inimical

(A) hostile

(B) opposed

(C) hospitable

(D) beneficial

Direction for Question Nos. 11 & 12

Replace the underlined common phrases with the right option.

11. The crew of the boat passed through terrible sufferings.

(A) underwent

(B) overcome

(C) prove

(D) discover

12. Such concern is as misplaced as it is deleterious.

(A) absurd

(B) concocted

(C) harmful and damaging

(D) misunderstood

Direction for Question Nos. 13 & 14

In this section some part/parts of each statement have been jumbled up. These parts have been labelled as P, Q, R, S. Four alternative arrangements of the parts have been given. The right arrangement to produce the correct sentence has to be identified.

13. Went back thanked her and to the cottage Joseph's mother.
P Q R S

- (A) QSPR (B) PQSR
(C) SQPR (D) SPRQ

14. For not keeping his he apologised previous day appointment the.
P Q R S

- (A) QPRS (B) QPSR
(C) RPSQ (D) RSQP

Direction for Question No. 15.


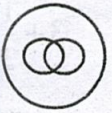
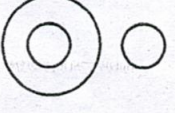

In this section each sentence is underlined and labelled in four separate sections-P, Q, R, S. Identify the section in which the error is located. If you feel that there is no error, section 'S' will signify a 'No error' response.

15. I find it difficult to cope up with your demands No error.
P Q R S

- (A) P (B) Q
(C) R (D) S

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PART - B

16. A train travelled at an average speed of 100 km/hr, stopping for 5 minutes after every 75 km. How long does it take to reach its destination 600 km from the starting point ?
- (A) 6 hrs. 24 mins (B) 6 hrs. 35 mins
(C) 6 hrs. 30 mins (D) 6 hrs. 40 mins
17. The day on 20th November, 2024 is
- (A) Monday (B) Tuesday
(C) Wednesday (D) Thursday
18. Which of the following Venn diagram represents relationship between cows, animals and goats ?
- (A)  (B) 
(C)  (D) 
19. In a row of 74 girls. Shweta is 27th from the left end. Palak is 7th to the right of Shweta. What is the position of Palak from the right end of the line ?
- (A) 40 (B) 41
(C) 42 (D) 44
20. Six friends Neha, Kavya, Gita, Varun, Pooja and Kapil have different ages, Gita is older than Pooja but younger than Varun. Three friends are older than Gita. The age of Kapil is between the ages of Varun and Kavya. Pooja is older than only one friend. Who is the youngest among them all ?
- (A) Pooja (B) Kapil
(C) Neha (D) Kavya

21. When SCIENCE is coded as VELGQEH, then BOTANY is coded as

(A) COWCQA

(B) CQWCPA

(C) EQWCPA

(D) EQWCQA

22. The arrangement of rational numbers $\frac{-7}{10}, \frac{5}{-8}, \frac{2}{-3}$ in ascending order is

(A) $\frac{2}{-3}, \frac{5}{-8}, \frac{-7}{10}$

(B) $\frac{5}{-8}, \frac{-7}{10}, \frac{2}{-3}$

(C) $\frac{-7}{10}, \frac{5}{-8}, \frac{2}{-3}$

(D) $\frac{-7}{10}, \frac{2}{-3}, \frac{5}{-8}$

23. The value of $\left[35.7 - \left(3 + \frac{1}{3 + \frac{1}{3}} \right) - \left(2 + \frac{1}{2 + \frac{1}{2}} \right) \right]$ is :

(A) 30

(B) 34.8

(C) 36.6

(D) 41.4

24. If $a + b + c = 13$, $a^2 + b^2 + c^2 = 69$, then find $ab + bc + ca$.

(A) -50

(B) 50

(C) 69

(D) 75

25. Each of X and Y got 8 wickets for 28 runs. Afterwards X got 2 wickets for 42 runs and Y got 4 wickets for 56 runs. Whose average of getting wicket is better?

(A) X better than Y

(B) Y better than X

(C) X and Y are same

(D) None of them

26. A man planted in his garden two types of trees—mango and pear. The number of mango trees are two more than three times of pear trees. If the number of pear trees is 77 then the number of mango trees is
- (A) 233 (B) 231
(C) 253 (D) 219
27. A Shopkeeper earns a profit of Rs. 2 by selling one pen and incurs a loss of Re. 1 per pencil. Shopkeeper in a particular month loses Rs. 5 when in this period 45 pens were sold. The number of pencil sold in this period is
- (A) 100 (B) 90
(C) 95 (D) 85
28. A certain work can be done by A and B in 4 days and B and C in 8 days. If C alone can do the work in 12 days, then how long will it take to finish the work by working A, B and C together?
- (A) $4\frac{1}{5}$ days (B) $4\frac{3}{5}$ days
(C) $4\frac{4}{5}$ days (D) 5 days
29. John appeared in English, Mathematics and Science examination securing 190 and 188 in English and Mathematics respectively out of 200 marks each. In order to secure 94% marks he must score out of 200 in Science
- (A) 192 (B) 190
(C) 188 (D) 186
30. X is sitting on a round table facing Y and Z is between X and U. If U faces north direction, the directions faced by Y and Z are
- (A) East and north-east (B) West and north-east
(C) East and south-east (D) West and south-east

31. Which one of the following Kings who does not belong to Rashtrakutas ?
(A) Dantidurga (B) Dhruva Dharavarsha
(C) Indra-IV (D) Shishunaga
32. Which Union Ministry has introduced a fresh Visa category named 'Ayush Visa' ?
(A) Ministry of AYUSH (B) Ministry of External Affairs
(C) Ministry of Home Affairs (D) Ministry of Health and Family Welfare
33. Which Mughal Emperor forbade the Parsis to celebrate their festival 'Navaroz' ?
(A) Jahanghir (B) Aurangzeb
(C) Muhammed Shah (D) Azam Shah
34. Which Schedule of the Constitution deals with the administration of the tribal areas in the North-eastern States of Assam, Meghalaya, Tripura and Mizoram ?
(A) Fifth Schedule (B) Sixth Schedule
(C) Seventh Schedule (D) Eighth Schedule
35. In which year Russia joined in the Group of G-7 and in which year it was suspended ?
(A) 1998 and 2015 (B) 1995 and 2011
(C) 1997 and 2014 (D) 1994 and 2004
36. Which of the following is the first State in India to have a separate department for Devyang ?
(A) Maharastra (B) Karnataka
(C) Tripura (D) West Bengal

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37. Who among the following acts as the Chairman of GST (Goods and Services Tax) Council of India ?
- (A) Union Finance Secretary (B) Prime Minister of India
(C) Chief Cabinet Secretary (D) Union Finance Minister
38. The King of Tripura as mentioned in "Mukut", a drama written by Rabindranath Tagore, is
- (A) Maharaja Govinda Manikya (B) Maharaja Amar Manikya
(C) Maharaja Kishore Manikya (D) Maharaja Dhanya Manikya
39. Which of the following statements are correct in respect of 'Nomadic Elephant' ?
- (i) It is an Indo-Mongolian joint military exercise
(ii) The fourteenth edition of this exercise took place in 2019
(iii) This exercise is aimed to train elephants in defence activities
(iv) The first edition of Nomadic Elephant took place in Gwalior, Madhya Pradesh.
- (A) (i) and (iii) (B) (ii) and (iv)
(C) (ii) and (iii) (D) (i) and (ii)
40. In which State in India the first instance of 'Captive Breeding of the Himalayan Vulture was recorded ?
- (A) Assam (B) Arunachal Pradesh
(C) Odisha (D) Meghalaya
41. Byopa is traditional headgear of tribes belonging to
- (A) Sikkim (B) Arunachal Pradesh
(C) Mizoram (D) Tripura

42. Which of the countries are Sea border countries to India ?

- | | |
|-----------------------|----------------------------|
| (1) China | (2) Sri Lanka |
| (3) Andaman & Nicobar | (4) Maldives |
| (5) Lakshadweep | (6) Dadra and Nagar Haveli |
| (A) 2 and 4 | (B) 1 and 6 |
| (C) 3 and 5 | (D) None of these |

43. Which is the first country to give voting rights to women ?

- | | |
|---------------|-----------------|
| (A) USA | (B) Sweden |
| (C) Australia | (D) New Zealand |

44. Which of the following place is famous for diamond mine ?

- | | |
|------------|-----------|
| (A) Khetri | (B) Gomia |
| (C) Panna | (D) Hampi |

45. The ancient 'Crystal Quartz Weighing unit' has been found in which Archaeological Site in India ?

- | | |
|----------------------------|--------------------------|
| (A) Konark (Odisha) | (B) Lothal (Gujarat) |
| (C) Dewar (Madhya Pradesh) | (D) Keeladi (Tamil Nadu) |

46. In which State in India India's first 'Village Atlas' 'Mayem Biodiversity Atlas' was launched ?

- | | |
|-----------------|---------------|
| (A) Maharashtra | (B) Goa |
| (C) Kerala | (D) Karnataka |

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47. Which is the longest river in Tripura ?
- (A) Manu (B) Gomati
(C) Feni (D) None of these
48. When is the 'International Day of Neutrality' observed ?
- (A) December, 1 (B) December, 5
(C) December, 12 (D) December, 22
49. Which institution published the book titled 'India : The Mother of Democracy' ?
- (A) Indian Council of Cultural Research
(B) Indian Council of Historical Research
(C) Election Commission of India
(D) NITI Aayog
50. The 'Dzukou Valley' is located in the borders of these two States.
- (A) Manipur and Mizoram (B) Mizoram and Tripura
(C) Meghalaya and Mizoram (D) Nagaland and Manipur

PART - C

51. A coin is tossed 5 times. The probability of a head is 0.5. The probability of exactly 3 heads is
- (A) 0.0625 (B) 0.1875
(C) 0.3125 (D) 0.4375
52. SQL is which type of language ?
- (A) Domain-Specific Language (B) General-Purpose Language
(C) Both (A) and (B) (D) None of these
53. A multiple choice examination has 4 choices for each question. A student has studied enough so that the probability they will know the answer to a question is 0.5, the probability that they will be able to eliminate one choice is 0.25, otherwise all 4 choices seem equally plausible. If they know the answer they will get the question right. If not they have to guess from the 3 or 4 choices.
- As a teacher you want the test to measure what the student knows. If the student answers a question correctly, what is the probability that they knew the answer ?
- (A) 0.61 (B) 0.67
(C) 0.71 (D) 0.77
54. An unbiased coin is tossed repeatedly until the outcome of two successive tosses is the same. Assuming that the trials are independent, the expected number of tosses is
- (A) 3 (B) 4
(C) 5 (D) 6

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55. Suppose that a shop has an equal number of LED bulbs of two different types. The probability of an LED bulb lasting more than 100 hours given that it is of Type-1 is 0.7, and given that it is of Type-2 is 0.4. The probability that an LED bulb chosen uniformly at random lasts more than hours is

(A) 0.44

(B) 0.55

(C) 0.66

(D) 0.77

56. What is the Median of data if its Mode is 15 and the Mean is 30 ?

(A) 22.5

(B) 30

(C) 27.5

(D) 25

57. Let X have a Poisson distribution with parameter $\lambda = 1$. What is the probability that $X \geq 2$ given that $X \leq 4$?

(A) 0.0962

(B) 0.0812

(C) 0.0756

(D) 0.0671

58. In a housing society, half of the families have a single child per family, while the remaining half have two children per family. The probability that a child picked at random has a sibling is _____.

(A) 0.44

(B) 0.55

(C) 0.66

(D) 0.77

59. A fair dice is rolled twice. The probability that an odd number will follow an even number is _____.

(A) $1/2$

(B) $1/6$

(C) $1/3$

(D) $1/4$

60. The Second Moment of a Poisson-distributed random variable is 2. Then the Mean of the random variable is ____.
- (A) 0 (B) 1
(C) 10 (D) 5
61. What is the broadcast MAC address in a typical Ethernet frame ?
- (A) FF:FF:FF:FF:FF:FF (B) 00:00:00:00:00:00
(C) 01:01:01:01:01:01 (D) 99:99:99:99:99:99
62. What is the time complexity of searching for a specific element in an unsorted array using a linear search ?
- (A) $O(1)$ (B) $O(\log n)$
(C) $O(n)$ (D) $O(n^2)$
63. The data structure required to check whether an expression contains a balanced parenthesis is
- (A) Queue (B) Stack
(C) Tree (D) Array
64. Compare the time complexity of enqueue and dequeue operations in a linked list implementation of a queue :
- (A) Enqueue : $O(n)$, Dequeue : $O(1)$ (B) Enqueue : $O(1)$, Dequeue : $O(n)$
(C) Both : $O(1)$ (D) Both : $O(n)$

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65. What happens if you try to dequeue from an empty queue?
- (A) It returns the last element added.
 - (B) It throws an error or exception.
 - (C) It returns a special value indicating emptiness.
 - (D) It dequeues the next element, regardless of emptiness.
66. Which of the following algorithms is the best approach for solving Huffman codes?
- (A) exhaustive search
 - (B) greedy algorithm
 - (C) brute force algorithm
 - (D) divide and conquer algorithm
67. Which of the following sorting algorithms has the lowest time complexity in the best case scenario?
- (A) Selection sort
 - (B) Merge sort
 - (C) Insertion sort
 - (D) Bubble sort
68. How does binary search compare to linear search in terms of efficiency for finding an element in a sorted array?
- (A) Binary search is always slower
 - (B) Binary search is always faster
 - (C) They have the same efficiency
 - (D) Efficiency depends on the array size
69. What is the key difference between a Binary Search Tree (BST) and a binary tree?
- (A) BST has fixed height, while binary tree can have any height.
 - (B) BST allows duplicate values, while binary tree does not.
 - (C) BST has ordered elements, while binary tree can have any arrangement.
 - (D) All of the above.

70. What is the main advantage of using linked lists compared to arrays ?
- (A) Faster random access (B) Dynamic size manipulation
(C) Simpler memory management (D) None of these
71. Perform the binary addition : $1101 + 1011$.
- (A) 11000 (B) 10110
(C) 11010 (D) 10000
72. Flip-flops differ from a latch in sequential circuit design'.
- (A) Flip-flops are level-sensitive ; latches are clocked.
(B) Flip-flops are clocked ; latches are level-sensitive.
(C) Flip-flops and latches are interchangeable.
(D) Flip-flops and latches have the same functionality.
73. How is addition performed in binary using a full adder circuit ?
- (A) XOR of inputs for sum ; AND, OR, and XOR for carry.
(B) AND of inputs for sum ; XOR, OR, and AND for carry.
(C) XOR of inputs for sum ; XOR, AND, and OR for carry.
(D) OR of inputs for sum ; XOR, AND, and OR for carry.
74. In Boolean algebra, what is De Morgan's theorem, and how is it used in digital logic design ?
- (A) It simplifies XOR operations.
(B) It expresses the complement of a product as the sum of complements.
(C) It simplifies AND and OR operations in terms of complements.
(D) It converts binary to Gray code.

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75. Design a 4-bit binary subtractor circuit using binary addition and explain the borrowing mechanism involved.
- (A) The borrowing mechanism involves adding 2 to the minuend.
 - (B) The borrowing mechanism uses XOR and AND gates to adjust the subtraction.
 - (C) The borrowing mechanism is not applicable in binary subtraction.
 - (D) The borrowing mechanism involves complementing the subtrahend and adding 1.
76. Given two binary numbers $A = 1101101$ and $B = 101011$. Perform the binary subtraction $A - B$.
- (A) 11001
 - (B) 111010
 - (C) 101010
 - (D) 1001001
77. A regular language over an alphabet Σ can be obtained using the operation
- (A) Union
 - (B) Concatenation
 - (C) Kleene*
 - (D) All of these
78. In a 3-input XOR gate, if inputs are $A = 1$, $B = 0$, and $C = 1$. What is the output?
- (A) 0
 - (B) 1
 - (C) A don't care condition
 - (D) Undefined
79. Given two floating-point numbers: $A = 1.001 * 2^2$ and $B = 0.11 * 2^3$, what is the result of $A * B$?
- (A) $0.1111 * 2^5$
 - (B) $0.111 * 2^5$
 - (C) $1.11 * 2^5$
 - (D) $0.011 * 2^5$

80. In a sequential circuit with states A, B, and C, if the current state is A and the next state is determined by the input as follows :
- If input is 0, stay in A.
 - If input is 1, transition to B.
- What will be the next state if the current state is A and the input is 1 ?
- (A) A (B) B
(C) C (D) Undefined
81. A computer has 256 MB of physical memory and a page size of 4KB. How many page frames are there ?
- (A) 64 (B) 128
(C) 256 (D) 1024
82. In a paging system with internal fragmentation, a process requires 7KB of memory, but is allocated a full 8KB page frame. What is the internal fragmentation percentage ?
- (A) 12.5% (B) 25%
(C) 50% (D) 75%
83. In a round-robin scheduling algorithm with a time quantum of 5 milliseconds, a process bursts 12 milliseconds, 8 milliseconds, and 3 milliseconds. What is the total waiting time experienced by the process ?
- (A) 7 milliseconds (B) 10 milliseconds
(C) 13 milliseconds (D) 18 milliseconds
84. A disk has 100 sectors, each sector is 512 bytes, and the cluster size is 4 sectors. What is the maximum file size on this disk ?
- (A) 20480 bytes (B) 40960 bytes
(C) 204800 bytes (D) 409600 bytes

85. The Shortest Remaining Time (SRT) is the preemptive version of which scheduling algorithm?
- (A) Round Robin (RR) (B) First Come First Serve (FCFS)
(C) Priority (D) Shortest Job Next (SJN)
86. What is the goal of a round-robin CPU scheduling algorithm?
- (A) Prioritize long-running processes to ensure completion
(B) Minimize the average waiting time for all processes
(C) Maximize CPU utilization and throughput
(D) Give higher priority to I/O bound processes
87. Which mechanism allows processes to exchange data and messages directly?
- (A) Semaphores (B) Shared memory
(C) Pipes (D) Signals
88. Which I/O scheduling algorithm prioritizes requests based on their arrival time?
- (A) First-Come-First-Served (FCFS) (B) Shortest Seek Time First (SSTF)
(C) SCAN (D) Priority scheduling
89. What is the main advantage of using threads compared to processes?
- (A) Improved security and isolation
(B) Faster context switching and resource sharing
(C) Better support for parallel processing
(D) More efficient memory management

90. What is the primary purpose of a system call in an operating system ?
- (A) Run arbitrary user code with full system access
 - (B) Request access to system resources and services in a controlled manner
 - (C) Communicate directly with hardware devices without OS intervention
 - (D) Manage other processes and control system behavior
91. What is the primary task of a lexical analyzer in a compiler ?
- (A) Identifies tokens based on keywords and identifiers
 - (B) Checks the semantic meaning of expressions
 - (C) Generates optimized machine code
 - (D) Builds the abstract syntax tree of the program
92. Which of the following is FALSE about a binary search tree ?
- (A) The left child is always lesser than its parent
 - (B) The right child is always greater than its parent
 - (C) The left and right subtrees should also be binary search trees
 - (D) In-order sequence gives decreasing order of elements
93. What is the difference between top-down and bottom-up parsing ?
- (A) Top-down starts with the smallest syntax unit, bottom-up starts with the largest.
 - (B) Top-down verifies rules against previous tokens, bottom-up constructs the parse tree
 - (C) Top-down is more efficient for smaller grammars, bottom-up for larger ones.
 - (D) All of the above.

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94. What type of grammar can be used for both top-down and bottom-up parsing ?
(A) LL(1) (B) LR(0)
(C) CFG (Context-Free Grammar) (D) None of these
95. What is the role of semantic actions in syntax-directed translation ?
(A) Attach type information to syntax tree nodes
(B) Perform code generation based on parse tree structure
(C) Check for semantic errors and type mismatches
(D) All of the above
96. What is the purpose of a symbol table in a compiler ?
(A) Stores machine code instructions for each source code segment
(B) Tracks the names, types, and memory locations of variables
(C) Manages program execution and function calls
(D) Optimizes the generated code for faster execution
97. What are the main components of a runtime environment ?
(A) Compiler, linker, loader
(B) Memory management, function call stack, heap
(C) Parser, optimizer, code generator
(D) Interpreter, virtual machine, JIT compiler
98. What are the benefits of using intermediate code instead of directly generating machine code ?
(A) Allows for different code generation backends for various platforms
(B) Simplifies the parsing and semantic analysis phases
(C) Reduces the memory footprint of the compiler
(D) None of the above

99. What is the goal of constant propagation optimization ?
- (A) Remove redundant expressions by replacing constants with their values
 - (B) Eliminate unnecessary function calls for known outcomes
 - (C) Reduce memory usage by allocating variables only when needed
 - (D) Improve branch prediction accuracy by analyzing control flow
100. Which of the following is NOT a common data flow analysis technique used in compilers ?
- (A) Constant propagation
 - (B) Reaching definitions
 - (C) Liveness analysis
 - (D) Type inference
101. Which of the following search algorithms has the best worst-case time complexity for searching a sorted array ?
- (A) Linear search
 - (B) Binary search
 - (C) Interpolation search
 - (D) Hash table lookup
102. What is the worst-case time complexity of searching for an element in an unsorted linked list ?
- (A) $O(1)$
 - (B) $O(\log n)$
 - (C) $O(n)$
 - (D) $O(n^2)$
103. The length of Hamiltonian Path in a connected graph of n vertices is
- (A) $n-1$
 - (B) n
 - (C) $n+1$
 - (D) $n/2$
104. What is the space complexity of the quicksort algorithm ?
- (A) $O(1)$
 - (B) $O(\log n)$
 - (C) $O(n)$
 - (D) $O(n^2)$

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105. Which of the following is NOT a benefit of using hash tables for data storage and retrieval ?

- (A) Fast average-case search time
- (B) Efficient memory usage
- (C) Guaranteed constant-time search
- (D) Ordered data representation

106. What does the "big O" notation represent in time complexity analysis ?

- (A) Best-case performance
- (B) Average-case performance
- (C) Worst-case performance
- (D) All of these

107. Which of the following statements is TRUE about the space complexity of an algorithm ?

- (A) It always dominates the time complexity.
- (B) It represents the additional memory used by the algorithm.
- (C) It is always independent of the input size.
- (D) Both (A) and (B) are true.

108. Which of the following is NOT a key characteristic of a greedy algorithm ?

- (A) Makes locally optimal choices at each step
- (B) Does not guarantee globally optimal solution
- (C) Might require backtracking to revise choices
- (D) Suitable for solving problems with optimal substructure

109. What is the main advantage of using dynamic programming compared to a naive recursive approach ?

- (A) It uses less memory
- (B) It requires less input data
- (C) It avoids redundant calculations
- (D) It guarantees faster execution time

110. Which port is commonly used for secure web traffic ?
- (A) 80 (B) 23
(C) 53 (D) 443
111. Which of the following addressing modes allows direct access to a memory location using its absolute address ?
- (A) Immediate addressing (B) Direct addressing
(C) Indirect addressing (D) Register addressing
112. In a 32-bit machine with a byte addressable memory, what is the maximum memory capacity achievable using immediate addressing ?
- (A) 2^{32} bytes (B) 2^{32} words
(C) 2^{16} bytes (D) 2^8 bytes
113. Which of the following operations is NOT performed by an ALU ?
- (A) Addition (B) Subtraction
(C) Multiplication (D) String manipulation
114. A 4-bit ALU can perform 2^n unique operations. What is the value of n ?
- (A) 2 (B) 4
(C) 8 (D) 16
115. The data path transfers data between which components ?
- (A) CPU and memory (B) Control unit and ALU
(C) Registers and ALU (D) All of these

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116. What is the main advantage of instruction pipelining ?

- (A) Increased memory access speed
- (B) Reduced instruction execution time
- (C) Improved data transfer rate
- (D) All of these

117. Which of the following pipeline hazards can stall the pipeline ?

- (A) Structural hazard
- (B) Control hazard
- (C) Data hazard
- (D) All of these

118. Which level of memory hierarchy has the fastest access time but smallest capacity ?

- (A) Cache
- (B) Main memory
- (C) Secondary storage
- (D) I/O devices

119. What is the role of an Interrupt Service Routine (ISR) ?

- (A) Handle I/O requests synchronously
- (B) Respond to external events asynchronously
- (C) Manage memory allocation
- (D) Perform data encryption

120. A computer has a main memory with a capacity of 16 MB and a cache with a capacity of 4 KB. If the cache block size is 32 bytes, how many cache blocks can fit in the main memory ?

- (A) 432,000 blocks
- (B) 524,288 blocks
- (C) 325,008 blocks
- (D) None of these

121. An entity in an ER model represents

- (A) Relationships between entities
- (B) Attributes of an entity type
- (C) A real-world object or concept
- (D) All of these

122. Which of the following is NOT a basic component of the relational model ?

- (A) Relations (tables)
- (B) Tuples (rows)
- (C) Attributes (columns)
- (D) Domains (data types)

123. What is the difference between relational algebra and tuple calculus ?

- (A) Relational algebra uses set-based operations, while tuple calculus uses logic expressions.
- (B) Tuple calculus is more powerful than relational algebra.
- (C) Relational algebra operates on entire relations, while tuple calculus operates on individual tuples.
- (D) All of these.

124. Which SQL statement is used to select specific columns and rows from a table ?

- (A) CREATE TABLE
- (B) INSERT INTO
- (C) UPDATE
- (D) SELECT

125. A B-tree index has a branching factor of 4 and stores 1000 key-value pairs. What is the minimum height of the B-tree ?

- (A) 1
- (B) 2
- (C) 3
- (D) 4

126. What is the goal of normalization in database design ?

- (A) To improve data redundancy.
- (B) To reduce data anomalies (insertions, deletions, updates).
- (C) To optimize query performance.
- (D) All of these.

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127. Which file organization allows efficient searching based on a sorted key?

- (A) Heap file
- (B) Ordered file
- (C) Hashed file
- (D) B-tree

128. What is the advantage of using B+trees over B-trees for indexing?

- (A) B+trees offer faster search performance due to more keys per node.
- (B) B+trees allow efficient range queries by including all key values in each leaf node.
- (C) B+trees require less storage space for the same number of keys.
- (D) B+trees are simpler to implement and maintain.

129. What does the ACID properties guarantee in a database transaction?

- (A) Atomicity, Consistency, Isolation, Durability
- (B) Availability, Confidentiality, Integrity, Data Independence
- (C) Access Control, Integrity, Distribution, Security
- (D) None of the above

130. A table has three attributes : an integer ID (4 bytes), a varchar name (average 20 bytes), and a datetime timestamp (8 bytes). If the table has 10,000 rows, approximately how much storage space does it require (assuming no overhead)?

- (A) 1.6 MB
- (B) 3.2 MB
- (C) 6.4 MB
- (D) 12.8 MB

131. Which information gathering technique is best suited for understanding user needs and pain points?

- (A) Structured interviews
- (B) Document analysis
- (C) Observation
- (D) All of these

132. What is the primary objective of feasibility analysis in a software project ?
- (A) Define the detailed system requirements
 - (B) Assess the project's technical, economic, and operational viability
 - (C) Design the system architecture
 - (D) Estimate the development timeline and cost
133. DFDs show the flow of data within a system. What symbol represents an external entity ?
- (A) Square
 - (B) Rectangle
 - (C) Circle
 - (D) Oval
134. What component of a process specification details the steps involved in an activity ?
- (A) Inputs
 - (B) Outputs
 - (C) Decision points
 - (D) Algorithms
135. Which factor should be considered when designing user interfaces for an information system ?
- (A) Technical feasibility only
 - (B) User needs and preferences
 - (C) System functionality solely
 - (D) Both user needs and functionality
136. Which life cycle model emphasizes iterative development and continuous feedback ?
- (A) Waterfall
 - (B) Agile
 - (C) Spiral
 - (D) Prototyping
137. What key element of project management helps track progress and identify potential risks ?
- (A) Communication plan
 - (B) Schedule
 - (C) Scope statement
 - (D) Risk management plan



138. What activity during the design phase defines the system architecture and components ?
- (A) Requirements analysis (B) Coding
(C) System design (D) Testing
139. Which software development principle emphasizes writing modular and reusable code ?
- (A) DRY (Don't Repeat Yourself)
(B) KISS (Keep It Simple, Stupid)
(C) YAGNI (You Ain't Gonna Need It)
(D) SOLID principles
140. What type of testing verifies the system's functional requirements based on user stories ?
- (A) Black-box testing (B) White-box testing
(C) Unit testing (D) Integration testing
141. Which switching technique establishes a dedicated communication path between source and destination for the duration of a conversation ?
- (A) Packet Switching (B) Circuit Switching
(C) Virtual Circuit Switching (D) Datagram Switching
142. What is the primary function of the Routing Information Protocol (RIP) in the context of routing protocols ?
- (A) Flooding (B) Shortest Path Routing
(C) Distance Vector Routing (D) Link State Routing

143. In IPv4 addressing, what is the purpose of CIDR notation ?
- (A) To indicate the Maximum Transmission Unit (MTU)
 - (B) To specify the address range and subnet mask in a concise format
 - (C) To identify reserved IP addresses
 - (D) To facilitate dynamic IP allocation using DHCP
144. What is the role of the Address Resolution Protocol (ARP) in computer networks ?
- (A) To translate domain names into IP addresses
 - (B) To discover the hardware address (MAC address) corresponding to an IP address
 - (C) To identify the route with the shortest path in a network
 - (D) To resolve network congestion issues
145. Which transport layer protocol is connectionless and provides minimal overhead, suitable for applications where low latency is crucial ?
- (A) TCP (Transmission Control Protocol)
 - (B) UDP (User Datagram Protocol)
 - (C) IP (Internet Protocol)
 - (D) ICMP (Internet Control Message Protocol)
146. What is the purpose of the Internet Control Message Protocol (ICMP) in the TCP/IP protocol suite ?
- (A) To provide secure communication over the internet
 - (B) To manage network congestion
 - (C) To facilitate the exchange of routing information
 - (D) To report errors and control messages related to network operations

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147. In the context of the HTTP protocol, what is the primary purpose of the OPTIONS method ?
- (A) To request information about the communication options available
 - (B) To request a representation of a specified resource
 - (C) To submit data to be processed to a specified resource
 - (D) To retrieve data from a specified resource
148. If a network uses IPv4 addresses and has a subnet mask of 255.255.255.224, how many subnets can be created, and how many hosts are possible in each subnet ?
- (A) 8 subnets, 30 hosts per subnet
 - (B) 16 subnets, 16 hosts per subnet
 - (C) 64 subnets, 6 hosts per subnet
 - (D) 128 subnets, 2 hosts per subnet
149. What is the key difference between UDP and TCP protocols in the transport layer ?
- (A) TCP offers guaranteed delivery, while UDP is unreliable.
 - (B) UDP is faster due to its connectionless nature.
 - (C) TCP provides flow control and congestion control mechanisms
 - (D) All of these.
150. A data link layer frame has a size of 1200 bytes, and the header size is 20 bytes. If the network uses a stop-and-wait protocol, what is the efficiency of the link if the transmission time for the frame is 5 milliseconds ?
- (A) 80%
 - (B) 85%
 - (C) 90%
 - (D) 95%
151. Which HTML5 element defines the main content of a web page ?
- (A) <nav>
 - (B) <header>
 - (C) <main>
 - (D) <footer>

152. What does CSS3 allow you to do with animations ?

- (A) Create complex 3D graphics
- (B) Trigger animations based on user interactions
- (C) Define smooth transitions between states
- (D) All of these

153. XML documents follow a strict structure because they are

- (A) used for displaying information on web pages
- (B) designed for data storage and exchange
- (C) meant to be visually appealing to users
- (D) optimized for fast loading times

154. In client-server computing, the server is responsible for

- (A) initiating requests and waiting for responses
- (B) responding to requests and sending back information
- (C) maintaining a connection between the client and the internet
- (D) None of these

155. What is the purpose of a proxy server in a network ?

- (A) Authenticating users accessing web applications
- (B) Accelerating the rendering of HTML pages
- (C) Acting as an intermediary between clients and servers, providing security performance benefits
- (D) Storing and managing session data for web applications

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156. The Model-View-Controller (MVC) architecture separates
- (A) User interface components and data storage
 - (B) Data, presentation logic, and user interaction
 - (C) Client-side and server-side functionalities
 - (D) Static content and dynamic elements
157. Web services utilize protocols like SOAP and REST to enable
- (A) Secure access to web pages protected by firewalls
 - (B) Programmatic communication between applications over the internet
 - (C) Real-time collaboration and data synchronization
 - (D) Dynamic loading of additional content within a web page
158. The DOCTYPE declaration in HTML5 serves to
- (A) specify the document type and version
 - (B) define the character encoding used
 - (C) link external stylesheets and scripts
 - (D) set the default viewport size for mobile devices
159. Compared to ``, the `<div>` element in HTML5 is primarily used for
- (A) Adding semantic meaning to content
 - (B) Creating block-level elements with distinct sections
 - (C) Emphasizing specific text within a paragraph
 - (D) Grouping inline elements without affecting layout

160. In web development, when implementing an MVC architecture, what are the challenges associated with maintaining a clean separation between the Model, View, and Controller layers?
- (A) Ensuring that the Model layer handles all user interactions
 - (B) Preventing tight coupling between the Model and View layers
 - (C) Minimizing the role of the Controller in handling business logic
 - (D) Encouraging direct communication between the View and Controller layers
161. What is a common security concern addressed by secure coding practices in software development?
- (A) Network latency
 - (B) Code optimization
 - (C) Buffer overflows and injection attacks
 - (D) User interface design
162. How does Blockchain contribute to enhancing cybersecurity?
- (A) By providing centralized control over data
 - (B) By offering encryption for data at rest
 - (C) By ensuring transparency and immutability of transaction records
 - (D) By reducing the need for multi-factor authentication
163. What is the primary purpose of a Hardware Security Module (HSM) in the context of secure programming?
- (A) To protect against DDoS attacks
 - (B) To store and manage cryptographic keys securely
 - (C) To optimize code execution speed
 - (D) To monitor network traffic



164. When implementing security measures for mobile apps, what is the significance of code obfuscation ?
- (A) To improve code readability
 - (B) To make the code more concise
 - (C) To hinder reverse engineering and tampering
 - (D) To enhance code portability
165. In the context of IoT security, what is a potential risk associated with the deployment of edge computing ?
- (A) Increased latency
 - (B) Limited device connectivity
 - (C) Reduced attack surface
 - (D) Enhanced data privacy
166. What is the core principle of blockchain technology ?
- (A) Centralized data storage with strong encryption
 - (B) Distributed ledger with immutable and transparent data
 - (C) Secure peer-to-peer communication using public-key cryptography
 - (D) High-performance computing for complex data analysis
167. What is a *firewall* in a computer network ?
- (A) A filtering software
 - (B) An Operating System of Computer Network
 - (C) A router or a computer to prevent unauthorized access
 - (D) A web browsing protection software

168. What ethical considerations should be addressed when developing and deploying facial recognition technology ?
- (A) Improving image processing algorithms for better accuracy
 - (B) Balancing security needs with privacy concerns and potential bias
 - (C) Integrating facial recognition with existing security infrastructures
 - (D) Implementing robust encryption to protect user data
169. Which cryptographic algorithm is commonly used in Blockchain to secure transactions by providing a secure, irreversible hash ?
- (A) SHA-256 (Secure Hash Algorithm 256-bit)
 - (B) AES (Advanced Encryption Standard)
 - (C) RSA (Rivest-Shamir-Adleman)
 - (D) DES (Data Encryption Standard)
170. How does Multi-Factor Authentication (MFA) improve security in mobile applications ?
- (A) By encrypting all data stored on the device
 - (B) By restricting access to specific locations and networks
 - (C) By requiring additional verification factors beyond a password
 - (D) By automatically updating apps to the latest security patches.